

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

Claims 1-19 (Cancelled).

20. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:
- a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a control cycle of the pulse-width-modulation control and durations of outputting of the voltage vectors;
 - a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors so that,
 - if total of the durations of outputting of the zero-voltage vectors in the control cycles is longer than a predetermined time, the voltage-vector adjusting unit adjusts durations of outputting of the zero voltage vectors to a fixed time or longer, and,
 - if the total is shorter than the predetermined time, the voltage vector adjusting unit adjusts the durations of outputting of the zero voltage vectors to zero; and
 - a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

21. (New) The apparatus according to claim 20, wherein the voltage-vector adjusting unit adjusts the durations of outputting of the zero voltage vectors to the fixed time or longer without changing relative ratio between durations of outputting of non-zero voltage vectors, excluding the zero-voltage vectors.

22. (New) The apparatus according to claim 20, wherein, the voltage-vector adjusting unit adjusts durations of outputting of non-zero voltage vectors, excluding the zero-voltage vectors, to another fixed time or longer, or to zero, if the voltage-vector adjusting unit adjusts the durations of outputting of the zero voltage vectors to zero.

23. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a plurality of control cycles of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors so that, if total of the durations of outputting of the zero-voltage vectors in the control cycles is shorter than a predetermined time, the voltage-vector adjusting unit adjusts durations of outputting of middle zero voltage vectors, between two adjacent control cycles, to zero, and distributes the durations of outputting of the middle zero-voltage vectors to duration of outputting of end zero-voltage vectors at ends of the two adjacent control cycles; and

a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

24. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a plurality of control cycles of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors so that, if total of the durations of outputting of the zero-voltage vectors in the control cycles is shorter than a predetermined time, the voltage-vector adjusting unit groups durations of outputting identical voltage vectors in the control cycles into one; and

a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

25. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a control cycle of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors so that, if total of durations of outputting the zero-voltage vectors is shorter than a predetermined value, upon receiving voltage vectors used for an adjustment in a previous control cycle, the voltage-vector adjusting unit, based on whether a voltage vector lastly output in the previous control cycle is a zero-voltage vector, adjusts a first duration of outputting one of the zero-voltage vectors in a

current control cycle to zero and distributes an amount of the first duration to a second duration of outputting another of the zero-voltage vectors; and

a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

26. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a control cycle of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors so that, upon receiving voltage vectors used for an adjustment in a previous control cycle, if a total of a third duration of outputting of a zero-voltage vector lastly adjusted in the previous control cycle and a fourth duration of outputting of a zero-voltage vector firstly received from the voltage-vector control unit in a current control cycle is shorter than a predetermined time, the voltage vector adjusting unit adjusts the fourth duration to a fifth duration which is obtained by subtracting the fourth duration from the predetermined time;

a delay unit that delays the voltage vectors output from the voltage-vector adjusting unit by one control cycle, and outputs the voltage vectors to the voltage-vector adjusting unit; and

a firing-pulse generating unit that generate a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

27. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a control cycle of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that

adjusts the durations of outputting of the voltage vectors by calculating an error generated by an adjustment of the durations of outputting of the voltage vectors and by correcting the durations of outputting of the voltage vectors in a current control cycle with the error calculated in a previous control cycle, and

adjusts total of durations of the zero-voltage vectors to a fixed time or longer, if the total is longer than a predetermined time, and adjusts the total to zero, if the total is shorter than the predetermined time;

a delay unit that delays the voltage vectors output from the voltage-vector adjusting unit by one control cycle, and outputs the voltage vectors to the voltage-vector adjusting unit; and

a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.

28. (New) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, voltage vectors, including zero-voltage vectors, output from the power converter in a control cycle of the pulse-width-modulation control and durations of outputting of the voltage vectors;

a voltage-vector adjusting unit that adjusts the durations of outputting of the voltage vectors by changing durations of outputting of the zero-voltage vectors to zero and replacing a first voltage vector firstly output in a current cycle with a last voltage vector lastly output in a previous control cycle, if the last voltage vector is different from the first voltage vector; and

a firing-pulse generating unit that generates a signal for turning on and off semiconductor switching elements included in the power converter, based on the durations of outputting of the voltage vectors, as adjusted by the voltage-vector adjusting unit.